WHAT IS CLAIMED IS:

1. An apparatus for compensating for distortion over a wideband, the apparatus comprising:

a predistortion circuit for generating a predistortion signal which compensates for third order and higher order intermodulation distortion products; and

a circuit for applying the predistortion signal to an input radio frequency signal.

2. The apparatus of claim 1, wherein the input radio frequency signal is a multi-tone radio frequency signal.

3. The apparatus of claim 1, wherein the circuit for applying the predistortion signal comprises a quadrature gain phase adjuster.

4. The apparatus of claim 1, wherein the predistortion signal is a low order polynomial.

5. The apparatus of claim 1, wherein the predistortion circuit generates a predistortion signal according to the following equation:

$$r = x|x|^2 C_2 + x|x| C_1 + xC_0$$

where r represents a predistorted input radio frequency signal, x represents the input radio frequency signal, and C_2, C_1, and C_0 represent adjustable complex control coefficients.

6. The apparatus of claim 1, further comprising a controller for adjusting the predistortion signal generated by the predistortion circuit.

14. The method of claim 12, wherein the predistortion signal is a low order polynomial.

15. The method of claim 12, wherein the predistortion signal is generated according to the following equation:

$$r = x|x|^2 C_2 + x|x|C_1 + xC_0$$

where r represents a predistorted input radio frequency signal, x represents the input radio frequency signal, and C_1, C_2, and C_0 represent adjustable complex control coefficients.

16. The method of claim 12, further comprising a step of adjusting the predistortion signal.

17. The method of claim 12, wherein the intermodulation distortion products are produced by a nonlinear amplifier, and the predistortion signal is applied to the input radio frequency signal prior to amplification by the nonlinear amplifier.

18 The method of claim 17, wherein the predistortion signal is adjusted based on a detected difference between the amplifier output and the input radio frequency signal.

19 The method of claim 12, wherein the step of generating the predistortion signal comprises the steps of:

detecting an envelope of the input radio frequency signal; and

generating the predistortion signal based on the detected envelope.

CLAIMS

1. A method of operating a communications system in which the magnitude of an input baseband data stream to be modulated on a transmitter carrier frequency is varied to counter the effects of channel distortion on a constellation of a recovered symbol stream.

2. A method as claimed in claim 1, characterised by vector modulating quadrature related components of a carrier signal and complements of the quadrature related components of the carrier signal with quadrature related components of the input base band data stream and complements of the quadrature related components of the said data stream, combining the modulated signals, propagating the combined modulated signals, receiving the propagated signals, recovering the quadrature related components of a data stream and the complements of said quadrature related components, decoding the base band data from said recovered components, determining if there are distorted constellation errors and in response to determining that there are constellation errors generating a control signal including data relating to said constellation errors, and adaptively adjusting the magnitude of the input baseband data stream in response to said control signals to predistort the data stream in such a manner as to reduce the distorted constellation errors.

3. A method as claimed in Claim 2, characterised in that the constellation errors are determined by comparing at least one complementary pair of the recovered signals.

4. A communications system comprising modulating means for quadrature modulating a carrier with an input baseband data stream, means for combining and propagating the modulated signals, means for receiving the propagated signals and recovering the baseband data stream, means for determining if the constellation of the recovered signals has been distorted and

for generating a control signal, and means responsive to the control signal for adjusting the magnitude of the input baseband data stream to predistort the modulated signals to minimise constellation errors in the recovered signals.

5. A communications system comprising first and second transceivers, the first transceiver comprising a transmitter section including a balanced direct carrier vector modulator having first inputs for quadrature related components of a carrier signal and complements of the quadrature related components and second inputs for quadrature related components of input data and complements of the quadrature related components of the input data, combining means for combining outputs of the balanced direct carrier vector modulator, signal propagation means coupled to said combining means, and means for adaptively adjusting the magnitude of the input data in response to control signals generated in and transmitted by the second transceiver, and the second transceiver having a receiving section including a demodulator for deriving quadrature baseband products of a received signal and a local oscillator signal and the complements thereof, decoding means for recovering data from an output of the demodulator, means for determining the presence of constellation errors in the demodulated signals and means for deriving a control signal in response to determining the presence of constellation errors, the second transceiver having means for transmitting the control signals to the first transceiver for use by said means for adaptively adjusting the magnitude of the input data to reduce the distorted constellation errors.

6. A communications system as claimed in Claim 5, characterised in that the means for determining the presence of constellation errors comprises means for comparing at least one complementary pair of demodulated signals.

7. A transceiver having an input for data signals, means coupled to the input for adjusting the magnitude of the data signals in response to an

external control signal, a balanced direct carrier vector modulator having a first input coupled to the data signal magnitude adjusting means, a second input for a carrier signal and an output for modulated signals, means for combining the modulated signals, signal propagation/receiving means coupled to said combining means and to a signal receiving means, demodulating means coupled to the signal receiving means, decoding means for recovering data signals in the demodulated signals, and means responsive to an external control signal indicating the presence of constellation errors in signals propagated by the propagating/receiving means, said control signal being applied to said means for adjusting the magnitude of the data signals, to predistort the data signals to be applied to the vector modulator.

8. A transceiver as claimed in Claim 7, characterised by means for determining the presence of constellation errors in demodulated signals, means responsive to determining the presence of constellation errors for deriving a control signal, said control signal being modulated on the carrier signal for propagation by the signal propagation/receiving means.

9. A transceiver as claimed in Claim 8, characterised in that the signal receiving means comprises means for recovering quadrature related versions of the received signals and the complements thereof and in that the means for determining the presence of constellation errors compares one of the quadrature related versions and its complement.